

Bayesian integration of external information into the single step approach for genomically enhanced prediction of breeding values

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An assumption to compute unbiased estimated breeding values (EBV) is that all information, i.e. genomic, pedigree and phenotypic information, has to be considered simultaneously.

However, current developments of genomic selection will bias evaluations because only records related to selected animals will be available. The single step genomic evaluation (ssGBLUP) could reduce pre-selection bias by the combination of genomic, pedigree and phenotypic information which are internal for the ssGBLUP. But, in opposition to multi-step methods, external information, i.e. information from outside ssGBLUP, like EBV and associated reliabilities from Multiple Across Country Evaluation which represent a priori known phenotypic information, are not yet integrated into the ssGBLUP. To avoid multi-step methods, the aim of the study was to assess the potential of a Bayesian procedure to integrate a priori known external information into a ssGBLUP by considering simplifications of computational burden, a correct propagation of external information and no multiple considerations of contributions due to relationships. To test the procedure, 2 dairy cattle populations (referenced by “internal” and “external”) were simulated as well as milk production for the first lactation of each female in both populations. Internal females were randomly mated with internal and 50 external males. Genotypes of 3000 single-nucleotide polymorphisms for the 50 males were simulated. A ssGBLUP was applied as the internal evaluation. The external evaluation was based on phenotypic and pedigree external information. External information integrated into the ssGBLUP consisted to external EBV and associated reliabilities of the 50 males. Results showed that rank correlations among Bayesian EBV and EBV based on the joint use of external and internal data and genomic information were higher than 0.99 for the 50 males and internal animals. The respective

correlations for the internal evaluation were equal to 0.50 and 0.90. Thereby, the Bayesian procedure can integrate external information into ssGBLUP.

(Keywords: Bayesian, genomic, external information, single step procedure)